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- THIEME, E. *Der wirtschaftliche Aufbau der Hanauer Edelmetallindustrie.* Ergänzungsheft der Zeitschrift für die gesamte Staatswissenschaft, LIII. (Tübingen: Laupp. 1920. Pp. ix, 144.)
- WYGODZINSKI, W. *Agrarwesen und Agrarpolitik.* (Berlin: Verein wissenschaftl. Verleger. 1920. 2.10 M.)
- Agricultural almanac for 1920.* Farmers bull. 1202. (Washington: Dept. Agri. 1921.)
- Annual report on the mineral production of Canada during the calendar year 1918.* (Ottawa: Mines Branch. 1919. Pp. 82.)
- Cotton production and distribution, season 1919-1920.* Bull. 145. (Washington: Census Bureau. 1921. 15c.)
- The farm loan contract.* Farmers bull. 1164, reprint. (Washington: Dept. Agri. 1921. 5c.)
- Livestock and animal products statistics, 1909-1919.* (Ottawa: Dominion Bureau of Statistics. 1921. Pp. 131.)
- Milk production.* Interim report of Agricultural Costings Committee. (London: H. M. Stationery Office. 2d.)
- Tenth Annual report by the Director of the Bureau of Mines.* (Washington: Dept. of the Interior, Bureau of Mines. 1920. Pp. 149.)
- World atlas of commercial geology.* Part I. *Distribution of mineral production.* (Washington: U. S. Geol. Survey. 1921. Pp. 72. \$2.)

### Manufacturing Industry

- Central Electric Light and Power Stations with Summary of the Electrical Industries, 1917.* Prepared under the direct supervision of EDMUND E. LINCOLN. (Washington: Bureau of the Census. 1920. Pp. 184.)

To the economist this report is of great significance. It is important because it is the first thoroughly comprehensive statistical study of the local utility industries—particularly that of furnishing electric energy—ever made by a trained economist. It also has far greater importance than the ordinary statistical census report because of the sidelights it throws on fundamental questions of economics. Dr. Lincoln's previous writings and the poise and absence of bias in his point of view toward utilities inspire the reader with great confidence in the permanent value of the report.

Already the Census Bureau has published three separate reports covering the utility industries, those of 1902, 1907, and 1912, so that comparisons of certain important figures are available for a considerable period of time.

One of the most interesting and instructive of these comparisons is that between the electric light and power central stations on the one hand and the electric railroads on the other. It appears, for illustra-

tion (Table 1), that in the decade from 1907 to 1917 the number of central light and power stations increased over one third (39 per cent), while the electric railways have increased only one twentieth (5 per cent); the total capitalization of the former has trebled from one billion dollars to three billion dollars, while the capitalization of the trolley lines has increased less than 40 per cent. Or, looking at the matter in another way, in 1902 there was nearly five times as much capital invested in the electric railways as compared with the lighting and power properties, whereas in 1917 there was not twice as much. Nor is the explanation far to seek. In the five years from 1912 to 1917 the net receipts of the central stations rose from sixty-seven million dollars to one hundred million dollars, whereas those of the trolley lines actually decreased from eighty-eight millions to eighty-one millions of dollars. In both 1912 and 1917 the central stations were making about the same percentage of net profit, 3.1 per cent, on their capitalization and, although a considerable proportion of this capitalization was represented by common stock unjustified by material investment, there is no reason to assume that the proportion was greater in one year than in another. We may therefore assume that for the central station industry as a whole, in spite of the increase in invested capital of about 50 per cent and in spite of the remarkable increase in technical efficiency and the widening use of electric energy, the rate of return on the investment has remained relatively and absolutely constant. Two observations are pertinent. The economies resulting from improved technique have been handed on undiminished to the public in the form of retarded rate increases. And furthermore the industry as a whole has reached a kind of point of equilibrium where there is neither increased nor decreased return on additions to the total capital investment. But the trolley lines show a far different situation. In 1912 they returned 2.1 per cent on the total capitalization; in 1917, 1.4 per cent—only two thirds as much.

It is impractical, within the space of a periodical review, to give even a cursory summary of the statistics presented in this report. Two matters, however, seem so important to the student of economics that they call for at least passing notice. They are concerned with the result shown by municipal ownership and operation as compared with private ownership and operation; and also the relative economies in the ultimate cost of electricity delivered to the consumer of small as compared with large generating plants.

The statistics covering municipal plants, though exhaustive, are not as significant as those of the privately owned plants; nor are they as instructive, for the municipal plants do little power business. (The income from power customers is five times as great as that derived from

lighting customers for private plants and about the same for municipal plants. Table 85.) Their equipment is small—an average of only 319 k.w. capacity, whereas that of the private companies is nearly 2,500 k.w. (Table 42). Stations of less than 500 k.w. could not, it would seem to the reviewer, pretend to do much of any power business or even an economical lighting business; yet there are, apparently, many municipal plants with less than 100 k.w. generating capacity. This difference shows itself in relative growth, for, as Dr. Lincoln puts it, “the rate of increase in the revenues of commercial plants has been more than nine times as rapid as the growth in number of stations, while for municipal plants it has been little more than twice as rapid” (p. 115). It shows itself also in the rates. “The average power rate [from which upwards of five sixths of the revenue of commercial plants is derived] charged by municipal stations, 1.08 cents is 50 per cent higher than the average reported by commercial plants” (p. 119). In fact, if one compares the statistics of private and municipal plants, page after page, table by table, the general impression grows that municipal plants in spite of inadequate depreciation charges, the total absence of taxes, and high managerial salaries, are giving the public a poorer service at a higher cost than private plants.

Few problems connected with what one might call production economics are more significant than that of the relative economies, per unit of product, of the large as compared with the small plant. It has been presumed by engineers, bankers, and the public that the larger the central station, the cheaper will be the cost of producing electric energy. And this economy is not only at the switchboard but also at the consumer's meter after adequate distribution expenses are allocated to the output. Theoretical considerations and practical experiments have seemed to justify this presumption, yet no attempts have been made to prove it by a comparison of actual costs gathered and arrayed according to some simple plan. Such a comparison, however, is possible by a careful inspection of the table of comparative costs appended to the report (ch. 10, pp. 126 and following) covering groups of selected central stations ranging from less than 200,000 to more than 200,000,000 k.w.h. annual capacity. Considering for brevity coal fuel steam plants only, it appears that the costs of producing electricity, per unit of output, declined steadily as the plants increased in size up to those of a capacity of from 10,000,000 k.w.h. to 20,000,000 k.w.h. At this range they stood at 2.16 cents per k.w.h. From this point throughout all the ranges of plants of higher capacity the costs per k.w.h. remained at approximately the same figure. The average costs of the nine stations of over 200,000,000 k.w.h. were more than those for the stations between 100,000,000 and 200,000,000

k.w.h. It would appear, therefore, that the costs of producing electricity declined steadily and uninterruptedly as the size of the structure increased, until a point of about 15,000,000 k.w.h. annual capacity was reached. Beyond this point the costs remained relatively constant. In other words, in all plants above this size there was a kind of equilibrium between the economies of large-scale production and the wastes of large-scale production. All economies of production can be obtained in a medium size plant that can be obtained in a giant plant. And, while this conclusion may run counter to some of the accredited notions of engineers, it is quite in harmony with the economics of production of other branches of industry.

There are many sections of the report which throw illuminating side-lights upon the public utility industry at the present time, but none that has a more vital significance to the public issues involved than a little paragraph at the end of page 119. It is a kind of summary of the plight into which the rising costs of commodities and the inelasticity of rates have thrown the utilities of the country. "A large number of plants were operated at a loss in 1917. The total number was 1,164, of which 761 were commercial and 403 municipal. In other words, 18 per cent of all the commercial stations and 17.4 per cent of the municipal stations, after the estimated value of free service have been allowed for, were operated at a deficit during the year."

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#### NEW BOOKS

- HAZARD, B. E. *Organization of the boot and shoe industry in Massachusetts before 1875.* (Cambridge: Harvard Univ. Press. 1921.)
- RESPONDEK, G. *Weltwirtschaftlicher Stand und Aufgaben der Elektro-industrie.* (Berlin: Springer. 1920. Pp. iv, 142.)
- WHEELWRIGHT, W. B. *From paper-mill to pressroom.* (Menasha, Wis.: George Banta Pub. Co. 1920. Pp. 102.)
- A handbook of the Canadian pulp and paper industry.* (Montreal: Canadian Pulp and Paper Assoc. 1920. Pp. 115.)
- The meat packing industry in America.* (Chicago: Swift & Co. 1920. Pp. 83.)
- Standard cotton-mill practice and equipment, with classified buyer's index.* (Boston: National Association of Cotton Manufacturers. 1920. Pp. 247.)

## Transportation and Communication

#### NEW BOOKS

- BRADLEE, F. B. C. *History of the Boston and Maine Railroad; with its tributary institutions.* (Salem, Mass.: Essex Institute. 1921. Pp. 84. \$2.)